

CLAIMS

1. A vibration wave driven apparatus comprising:
a driven member;
5 an elastic member having one surface opposed to said driven member, and another surface, said elastic member having a plurality of contact parts formed on the one surface and disposed in contact with said driven member, said elastic member being formed of a
10 single member; and
an electromechanical conversion element joined to the other surface of said elastic member;
wherein at least one of said elastic member and said electromechanical conversion element has a portion
15 thereof opposed to said driven member, said portion having at least one recessed part formed therein at a location other than said contact parts, whereby said elastic member is disposed in contact with said driven member at said contact parts.
- 20 2. A vibration wave driven apparatus according to claim 1, wherein said elastic member has a second portion not opposed to said driven member, said second portion being flush with said contact parts.
3. A vibration wave driven apparatus according
25 to claim 1, wherein said elastic member is formed from a metal plate material by press punching or by an etching process.

4. A vibration wave driven apparatus according to claim 1, wherein said electromechanical conversion element comprises a laminated piezoelectric element having piezoelectric materials and electrode materials alternately laminated one upon another.

5. A vibration wave driven apparatus according to claim 1, wherein said elastic member includes a plurality of second recessed parts for adjusting vibration characteristics of the vibrator formed therein at a plurality of locations thereof.

6. A vibration wave driven apparatus according to claim 1, wherein said elastic member has at least one supporting part integrally formed thereon, for supporting the vibrator.

7. A vibration wave driven apparatus according to claim 1, wherein said electromechanical conversion element excites said elastic member in a plurality of out-of-plane bending vibration modes having different wavelength directions.

8. A vibration wave driven apparatus according to claim 7, wherein said plurality of contact parts are formed in a vicinity of loops of one of the bending vibration modes and in a vicinity of nodes of another one of the bending vibration modes.

9. A vibration wave driven apparatus according to claim 1, wherein said contact parts have at least one space formed in a surface thereof opposed to said

electromechanical conversion element.

10. A vibration wave driven apparatus according to claim 1, wherein said driven member and said elastic member form a magnetic circuit.

5 11. A vibrator comprising:

an elastic member having one surface and another surface, said elastic member having a plurality of contact parts formed on the one surface, said elastic member being formed of a single member; and

10 an electromechanical conversion element joined to the other surface of said elastic member;

wherein said electromechanical conversion element excites said elastic member in a plurality of out-of-plane bending vibration modes having different
15 wavelength directions, and said elastic member has a recessed part formed on the one surface thereof between said plurality of contact parts.

12. A vibrator according to claim 11, wherein said elastic member is formed from a metal plate
20 material by press punching or by an etching process.

13. A vibrator according to claim 11, wherein said electromechanical conversion element comprises a laminated piezoelectric element having piezoelectric materials and electrode materials alternately laminated
25 one upon another.

14. A vibrator according to claim 11, wherein said elastic member includes a plurality of second

recessed parts for adjusting vibration characteristics of the vibrator formed therein at a plurality of locations thereof.

15 15. A vibrator according to claim 11, wherein said elastic member has at least one supporting part integrally formed thereon, for supporting the vibrator.

16. A vibrator according to claim 11, wherein said plurality of contact parts are formed in a vicinity of loops of one of the bending vibration modes and in a vicinity of nodes of another one of the bending vibration modes.

17. A vibrator according to claim 11, wherein said contact parts have at least one space formed in a surface thereof opposed to said electromechanical conversion element.